Heavy-Duty Floors

with 'INCOR' 24-Hour Cement

SATURDAY NOON: After close of business, the old floor is dug up and resurfacing begins. 'Incor' concrete is placed Saturday night, job completed early Sunday morning.

MONDAY 8 A.M.: New floor in use, no interruption to business, and 'Incor' concrete thoroughly cured. A better floor in a fraction of the usual time.

A PROMINENT builder recently said that "the floor is the only part of the structure that receives any wear—yet, it usually gets the least attention." Like most generalities, this one appears to have some basis in fact; for recent observation indicates that two out of every three industrial floors today need repair or complete resurfacing. In this book, emphasis is placed upon repairs to existing floors. However, the same methods are used in new construction, both monolithic and placed-afterward; the only essential difference being in the preparation of the base.

Heavy-Duty Floors

How Heavy-Duty Floors are built and repaired . . . Thorough curing essential . . . Why 'Incor' Cement makes better floors, in a fraction of the usual time.

FOREWORD

Most industrial floors take a terrific beating; steel-tired trucks, acids and corrosives, as well as less aggressive agents are encountered. So, in addition to adequate strength, a heavy-duty floor must also be dense and watertight. And that means *good* concrete. Unsound, slipshod methods which get by elsewhere, soon show up in a floor.

Fortunately, the problem is simple, because the selection of materials and water content, as well as methods of mixing, placing and finishing are well standardized. Follow carefully and skilfully a few simple rules based on sound principles, and satisfactory results are readily obtained.

The problem comes down to a question of adequate curing. Here a note of caution is important: For durability the floor must be thoroughly cured, —most floor failures are due to insufficient curing.

To be dense, watertight and wear-resisting, concrete made with ordinary Portland cement has to be kept wet 10 days. The reader can answer from his own experience how many jobs get that much curing! As a matter of fact, it is usually impossible to wait that long—a floor has to be used, curing stops too soon, and the quality of the concrete suffers.

Through a basic improvement in the process of manufacturing Portland cement, 'Incor' has *five times the curing efficiency of ordinary cement*. That is to say, 'Incor' combines with water five times as fast, so it only has to be kept wet one-fifth as long.

Thus, in 24 hours an 'Incor' concrete floor is ready for heavy traffic; and in 48 hours, 'Incor' concrete is as dense, durable and watertight as ordinary concrete at the end of ten days. Any floor can be kept wet 48 hours—but 10 days is another story!

By producing thoroughly cured concrete *within the time limits imposed by practical necessity*, 'Incor' in the hands of skilled workmen produces longer-wearing heavy-duty floors.

It costs money to cure concrete; by saving 8 days' curing expense, 'Incor' introduces a new factor of economy in floor construction.

Finally, with 'Incor' a heavy-duty floor can be completely resurfaced over a single week-end, without costly interruption to business. This removes one of the biggest obstacles to adequate floor maintenance. There is no longer any sound reason for putting up with the waste and inconvenience of a worn-out floor, when a new and more durable floor-topping can be placed after the close of business Saturday—and be ready for heavy-duty service first thing Monday morning.

PREPARING THE BASE

Digging Out

In resurfacing an old floor, the surface should be removed and the concrete roughened with pick, air-drill or other mechanical device, in order to secure a good bond. When only part of a floor is to be repaired, sufficient concrete must be removed so that the surface of the new work will be level with the surrounding floor. This is done by digging out a depth equal to that of the top to be placed, usually about one inch.

Sweeping and Washing

The base is then carefully swept and washed. One operator successfully uses a portable pump developing 250 to 400 pounds, delivering water through a $\frac{1}{8}$″ nozzle. The pressure produces a high-velocity stream that thoroughly cleans all pockets in the base; the small diameter nozzle minimizes the quantity of water to be removed from the floor after cleaning. This water jet also removes all loose material from the base, which is then ready to receive the grout. Where high pressure is not available, extra care should be taken to wash and broom thoroughly.

New Construction

While the surface of the slab is still soft, it should be thoroughly roughened with a rake or steel broom. This removes scum and assures a good mechanical bond with the top when placed. The base should be kept wet until thoroughly cured—10 days with ordinary cement, 24 hours with 'Incor.' Thorough curing of the base is necessary to avoid shrinkage cracks that may also affect the top.

If the top is applied monolithic with the base it should be laid within 45 minutes after the base is placed. As the top will draw any excess water out

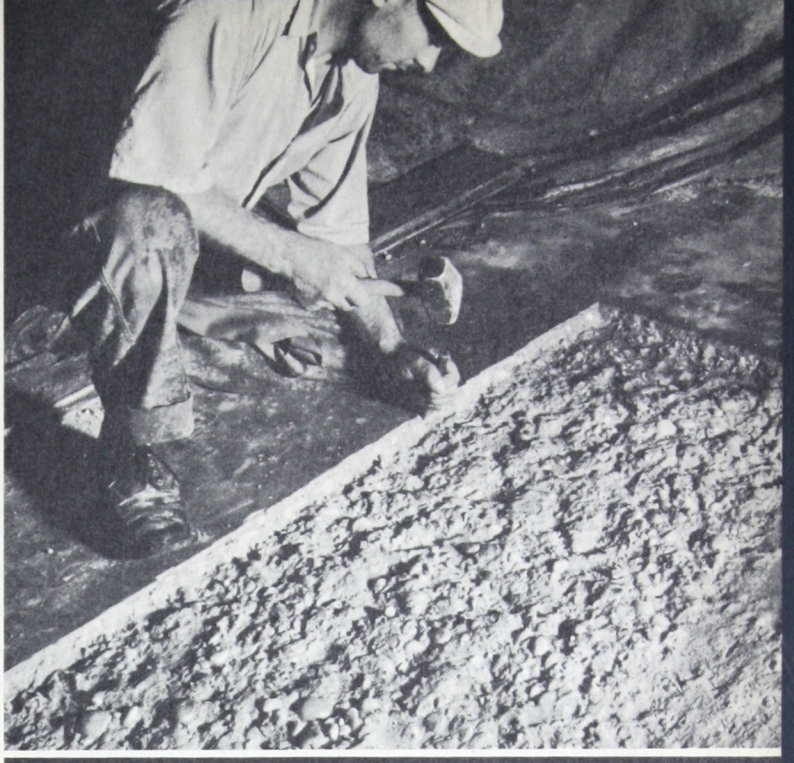
of the base, the total water content of base and top must be kept low enough to prevent the finishing operations from bringing fine material to the surface.

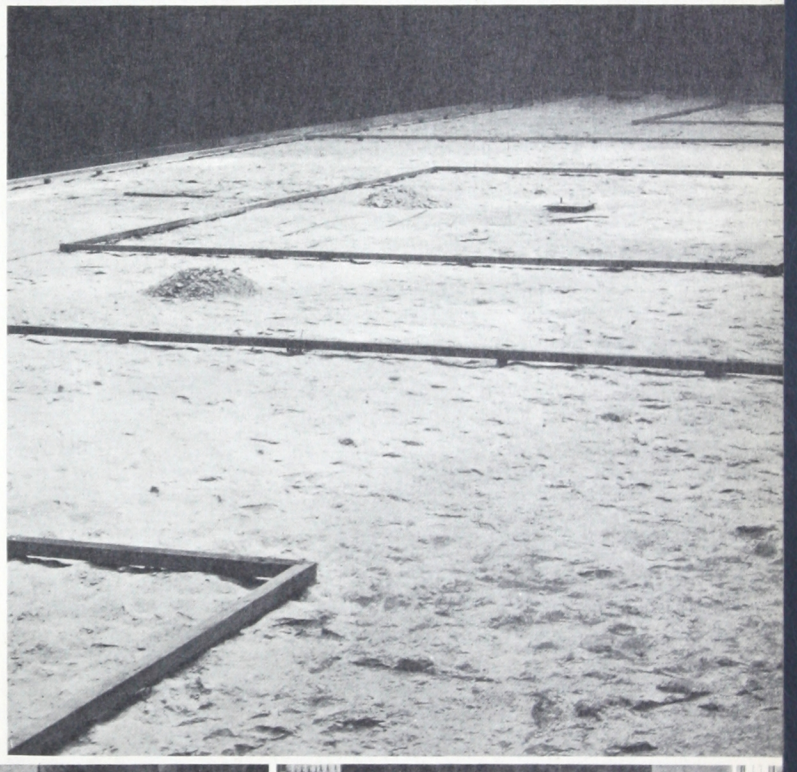
Trimming the Edge

On floor patches, care must be taken to get a strong, durable bond between the old wearing course and the new. The edges of the chipped out area should be cut clean and vertical to full depth; the bottom should be roughly leveled so that it forms a right angle with the edge. If carelessly handled, the joint is usually the first part of the floor to break down in use.

Setting Screeds

Before placing the concrete, wooden strips or screeds are set in cement mortar at distances convenient for straight-edging, say 8 to 10 feet. These strips are brought to grade by means of spirit-level, chalk-line or other method. A true, level floor depends upon the accuracy with which this work is done.





SOUND JOINTS IMPORTANT: Thorough bond between new and old work is important. Carelessly made joints will break down and widen under traffic. In extreme cases, a serious rut may develop. Photograph at left shows an improperly made joint between the floor slab and a section which was placed later, to close an elevator opening. Note how edges have broken down under traffic; surface cracks indicate inadequate curing. Photograph at right shows how such a joint, without maintenance, will develop into a serious depression. A properly made joint is illustrated in the centre picture.

DESIGNING THE MIX

Selecting Aggregates

Care should be exercised in the selection of both fine and coarse aggregates. Sand should consist of hard, durable particles, all of which will pass through a ¼″ sieve and not more than 10 per cent through a 50-mesh sieve. Coarse particles should predominate.

Clean, hard pea-gravel or crushed stone—free from dust, clay, loam or organic impurities, as well as soft, flat, or elongated particles—should be used. All material should pass through a sieve having ⅜″ openings and be retained on one having ¼″ openings. The maximum size of the largest particles should not exceed one-third of the thickness of the floor topping.

Proportioning Materials

A heavy-duty floor surface must be strong, dense, watertight. Watertightness is imperative; by preventing the penetration of water, dilute acids or other aggressive liquids, the life of the floor is greatly increased. Besides, watertight concrete is good concrete and therefore wear-resisting.

Watertight concrete is obtained by mixing proper proportions of cement and water with good sand and stone; placing the concrete without segregation, and curing it thoroughly.

The amount of water must be carefully controlled. For machine floating, use 3½ to 4 gallons of water to each 94-pound bag of cement. For hand floating, use 4¼ to 4¾ gallons. Reduce the quantity of added water by ½ gallon if sand is moist, or by 1 gallon if sand is wet. Measure water carefully—don't guess.

With properly graded aggregate, proportions of from 1—1—1½ to 1—1—2 (cement, sand and coarse aggregate) give satisfactory results. These mixes usually produce workable concrete and allow finishing without excessive troweling. Here the greater workability of 'Incor' Cement is helpful; 'Incor' concrete is easier to place and compacts more readily into a dense mass, because it is more plastic.

PLACING

Grouting the Base

The base is thoroughly wetted. Then a 1 to 1 cement-sand grout is brushed into the base. The grout provides a bond between the base and the new top.

Spreading Concrete

While the grout is still soft, the concrete is spread evenly with shovel or rake. The surface of the loosely-placed material is maintained above grade sufficiently to allow for compaction.

Tamping and Rolling

When deposited, the concrete has an open structure, due to the limited quantity of water used in the mix. It is therefore necessary to compact the concrete thoroughly, in order to obtain the necessary density and to force the new material into the pockets in the base. Compacting is necessary in order to obtain a proper bond between base and top, as well as to secure a dense, durable surface.

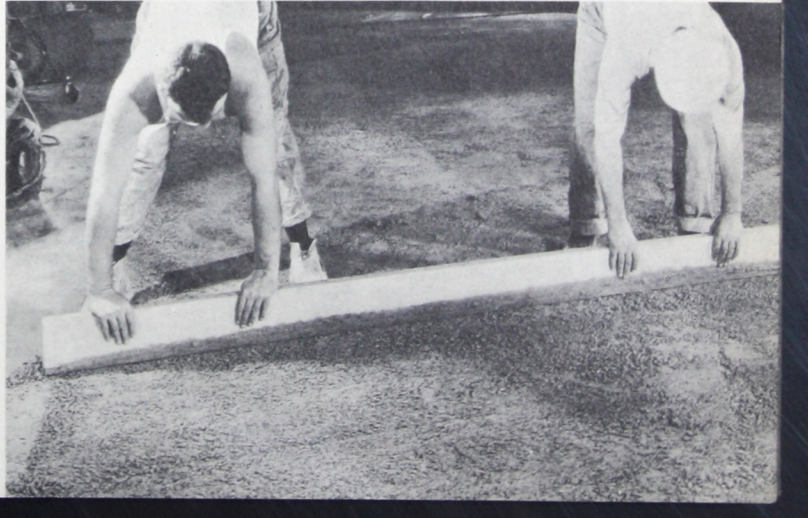
The loosely-spread concrete is compacted, first by tamping and then by a small, heavy roller. The roller illustrated weighs over five hundred pounds. Note the scraper which removes picked-up material from the surface of the roller.

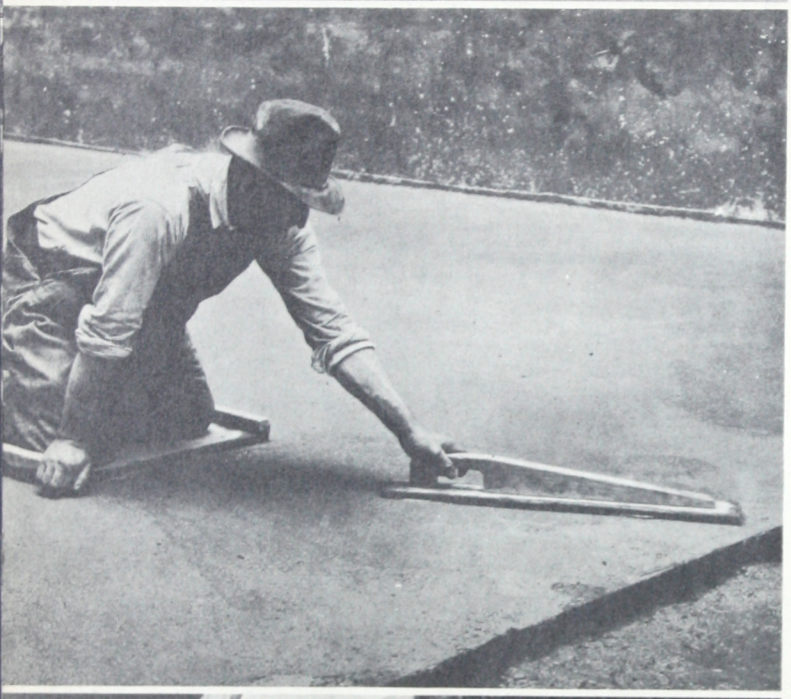
Tamping and rolling drive the topping down into the grouted base, helping to secure a bond between base and top. A good bond is necessary; the topping cannot stand up under use unless firmly 'welded' to the base. Tamping and rolling also bond the vertical surfaces where new topping joins the old.

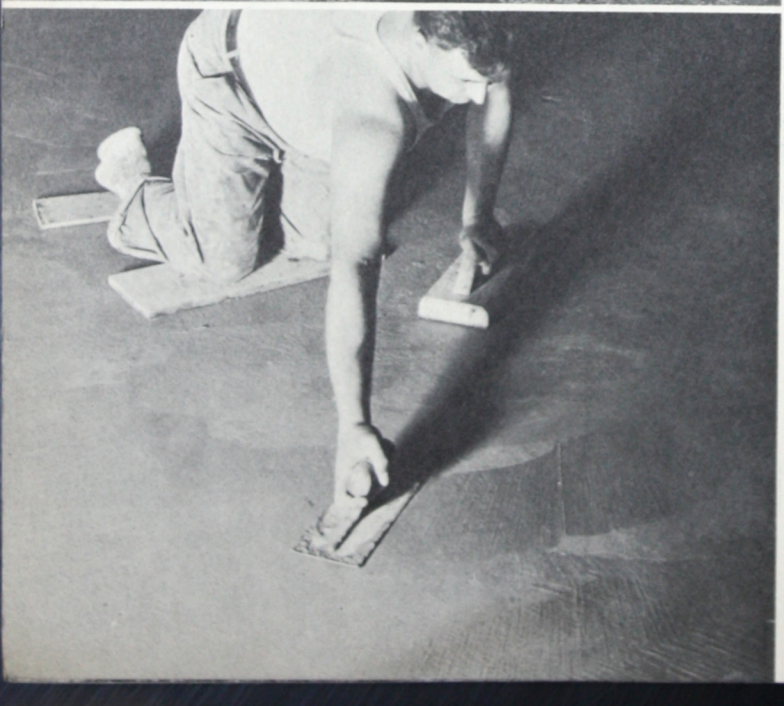
Cutting or Straight-edging

Next the concrete is cut to grade by the sawing movement of a straight-edge resting upon wooden screeds which indicate the proper thickness of the topping. Any low spots are built up to grade by adding more concrete.

After the floor has been struck to grade, the screeds are removed and the space left thereby is filled with concrete, which is tamped and rolled.







FINISHING

Machine Finishing

Machine finishing makes it possible to get a smooth surface with a very dry mix. A dry mix prevents separation of coarse from fine material, minimizes shrinkage, and keeps coarse material at the surface where it is needed to increase resistance to wear. With wet mixes, water and the fines from cement and sand tend to come to the surface in finishing; this may result in crazing, scaling, and dusting in the finished floor.

The machine illustrated compacts and levels out the topping by means of a rotating steel disc. It brings to the surface only enough mortar to facilitate steel troweling. This is only possible when the correct water content is used. Note that the operator's feet make no depression in the dry, compacted mass.

Hand Finishing

When finishing by hand instead of by machine, wooden or cork floats are used to fill up the hollows and iron out the humps left after cutting. This work should continue until a true, level surface is obtained. Care must be exercised not to draw any more fine material from the mass than is actually required to coat particles of coarse aggregate at the surface.

Final Finishing or Troweling

Finishing with a steel trowel is the final step; it helps to make the surface dense, impervious and smooth. Four or five passes with the trowel are usually sufficient.

With a dry mix, which has been floated by machine, there is practically no movement of finer materials to the surface during hand troweling. The float will draw too much fine material to the surface of a wet mix, impairing the wearing quality of the finished floor.

If the methods outlined in this book are carefully followed, there will be no excess water. However, if too much water has been used, be careful not to use the steel trowel while any water sheen remains on the surface.

CURING

You can easily put too much water on the inside of concrete, that is to say, in the mix; but you can't put too much water on the outside, that is to say, in curing it.

The most effective method of curing is to flood the surface of the floor with water. If necessary, form low dikes of earth or other material, to prevent water from running off. Coverings of burlap, or similar material, kept thoroughly saturated with water, also may be used.

As the greatest water loss through evaporation and absorption occurs during the first few hours, it is important to begin curing not more than six hours after placing the concrete.

Why Curing Is Important

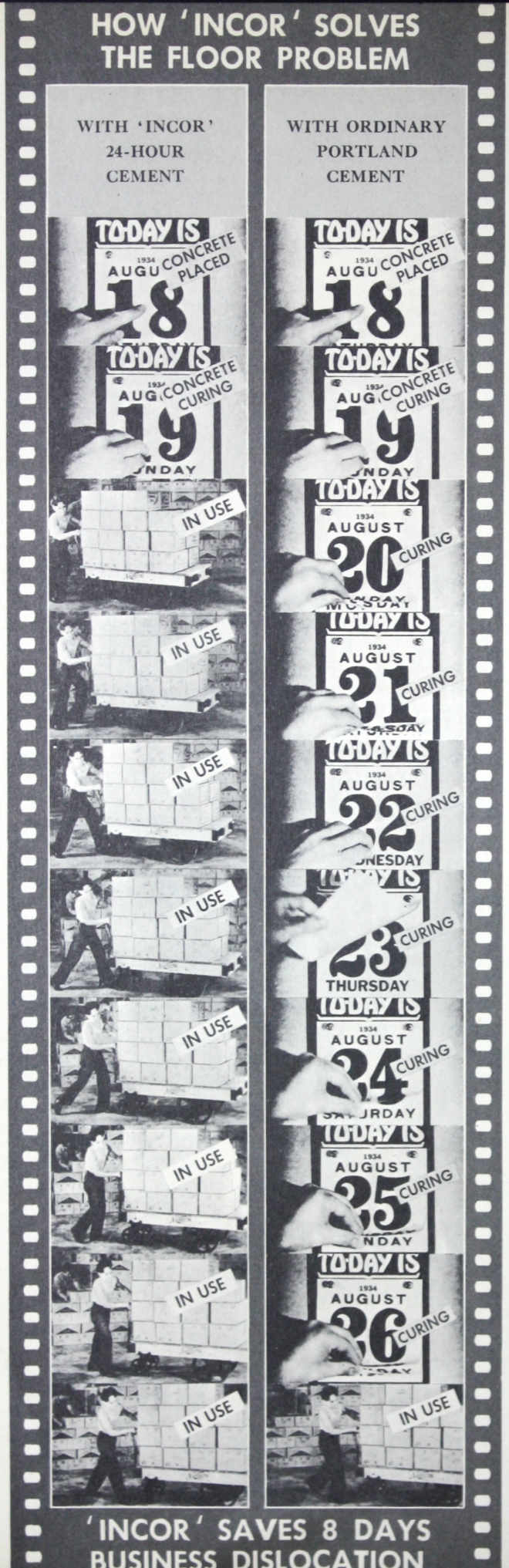
The importance of curing is apparent when it is recalled that newly-placed concrete does not attain strength by "drying out." In fact, the opposite is true. Concrete hardens and attains strength by a chemical reaction between cement and water. This reaction begins when the water and cement are mixed, *but continues only as long as water is kept in the concrete.* If the slab is allowed to dry out before curing is well advanced, strength and durability are impaired.

For concrete subjected to grueling wear, as in heavy-duty floors, 10 days' curing under water is necessary when ordinary Portland cement is used. But job conditions impose drastic limits on the length of curing time—a factory or warehouse floor simply cannot be kept out of use that long; a road or driveway must be opened to traffic; even on new buildings, plumbers, carpenters and electricians must use the floor. Because the floor has to be used, curing stops too soon—and the quality of the concrete suffers.

How 'Incor' Solves the Problem

Through a basic improvement in the process of manufacturing Portland cement, *'Incor' cures, that is, combines with water, five times as fast as ordinary cement.* That is why an 'Incor' floor—so far as strength is concerned—is ready to use in 24 hours.

In fact, because it cures five times as efficiently, 'Incor' kept wet for only 24 hours has greater durability and watertightness than ordinary concrete as cured on the average job. However, we



recommend that heavy-duty floors made with 'Incor' be kept wet for 48 hours—at which time the concrete is as thoroughly cured as ordinary cement at the end of 10 days.

Any floor can be kept wet 48 hours—but 10 days is decidedly another story! By producing thoroughly cured concrete in the limited time the floor can be kept wet, 'Incor' in the hands of skilled workmen produces longer-lived floor surfaces.

Used In Leading Industrial Plants

Since it was first introduced eight years ago, the nation's leading industrial concerns have been turning to 'Incor' for the solution of the heavy-duty floor problem. To sum up the reasons:

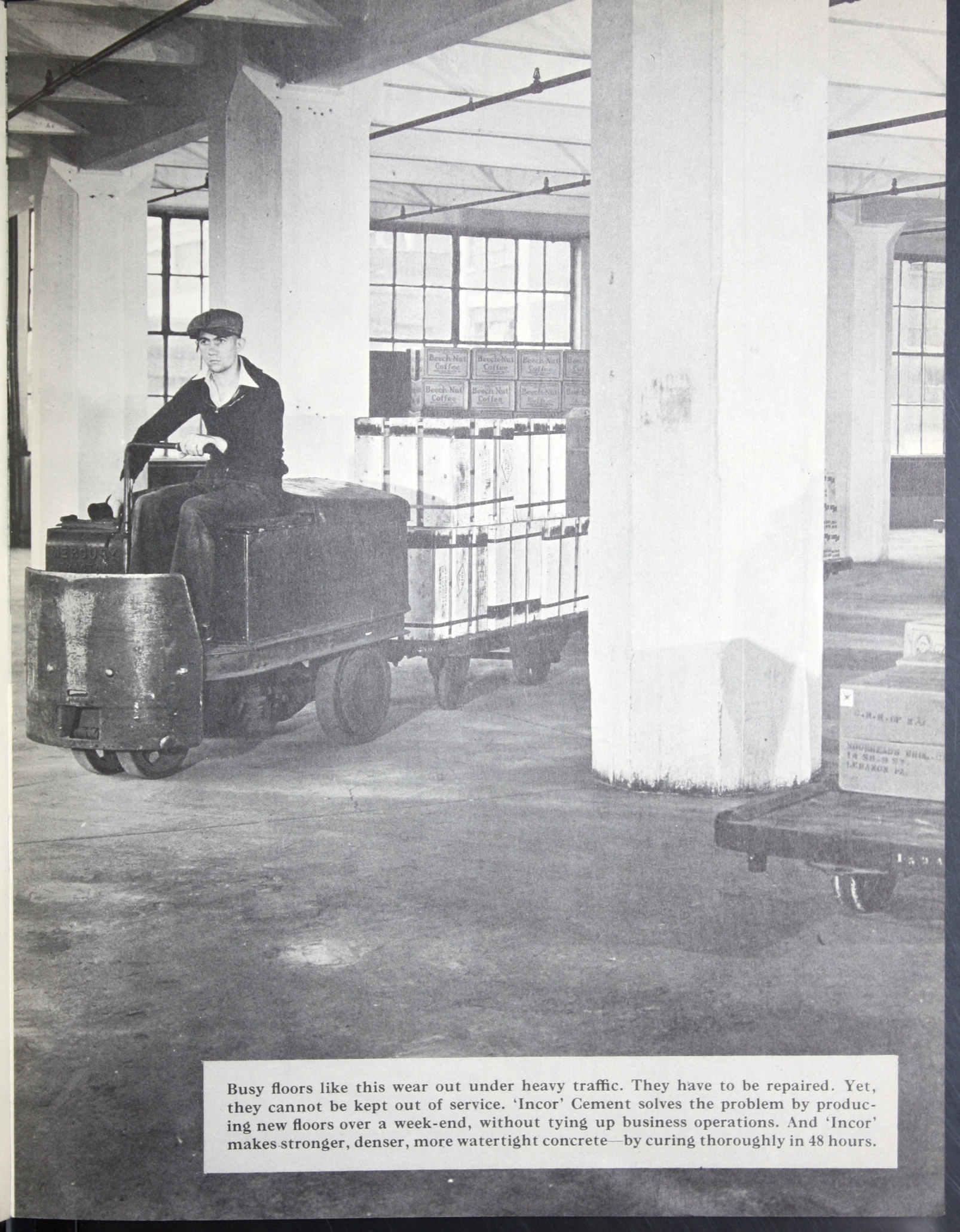
'Incor' produces concrete which is stronger, more watertight and longer wearing—because it cures thoroughly in the short time the floor can be kept wet. At the same time, it substantially reduces curing costs.

In addition, 'Incor' makes it possible to re-surface a floor without tying up business. A new 'Incor' floor topping can be placed over a single week-end; the entire job—from digging out the old floor to the new topping, thoroughly cured and ready for service—is now completed between the close of business Saturday and opening time Monday morning.

'Incor' prevents business dislocation for the same reason that it makes longer-wearing concrete —simply because it is a *better* Portland cement.

WHEN WINTER COMES: Practice outlined in this book is based upon normal temperatures. In Winter, the greater curing efficiency of 'Incor' minimizes the period of heat curing. Thus heating costs are reduced—new floor surfaces are placed and put in service on Summer schedules. For details, write for booklet entitled "Winter Construction with 'Incor'* 24-Hour Cement."

*Reg. U. S. Pat. Off.



Busy floors like this wear out under heavy traffic. They have to be repaired. Yet, they cannot be kept out of service. 'Incor' Cement solves the problem by producing new floors over a week-end, without tying up business operations. And 'Incor' makes stronger, denser, more watertight concrete—by curing thoroughly in 48 hours.

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